

5.0 CUMULATIVE IMPACTS

5.1 INTRODUCTION

Compliance with NEPA requires analysis of the cumulative impacts of each alternative. Cumulative impacts are those resulting from the incremental impact of an alternative when added to other past, present and reasonably foreseeable future actions, regardless of who has taken those actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. A cumulative impact scenario has been developed which identifies those past, present and reasonably foreseeable future actions that may contribute to a significant cumulative effect when combined with the effects of the alternatives.

Past and Present Actions Already Analyzed

Humans have altered the environment in numerous ways since settlement times. Table 5.1-1 describes past and present human actions affecting natural resources in the Project Area. These past and present actions have resulted in the affected environment as described in Chapter 3. The cumulative impacts of the actions in Table 5.1-1 have thus been accounted for as part of the impact analysis in Chapter 4, and will not be considered further in this document.

Ongoing and Reasonable Foreseeable Future Actions

Table 5.1-2 provides a listing of presently ongoing activities and reasonable foreseeable future actions which combined with the alternatives could result in a significant cumulative impact. For the reasonable foreseeable future actions (RFFA), it is important to note these are projections made only for the purpose of predicting future impacts. RFFA items are assumptions for analysis and are not part of the Proposed Action or alternatives. Inclusion in the RFFA scenario does not constitute a decision nor a commitment of resources. If a future action requires NEPA compliance, inclusion in this cumulative impact scenario would not satisfy that requirement.

5.2 PROJECTS EVALUATED

A list of key project components and activities for ongoing, proposed, and potential projects to be assessed in this cumulative effects analysis is provided in the following sections. Except for air quality, the ongoing and proposed CBM projects are considered to be most likely to cause cumulative impacts, and therefore are described and evaluated in detail. The other projects are described and evaluated in less detail. The projects evaluated for the air quality cumulative analysis were determined by the BLM, USEPA, and UDAQ. Refer to Section 5.2.5.

5.2.1 Ongoing CBM Projects

Five ongoing CBM exploration and development projects have been approved through the NEPA compliance process and are at various stages of development. Three of the five projects are located north of the Price EIS Project Area; Castlegate CBM Project, Matt's Summit CBM Exploration Project, and Helper CBM Pilot Project. The remaining two projects, the Grimes Wash CBM Pilot Project and Buzzard Bench Project, are located southwest of the EIS Project Area. These projects are shown on Plate 26.

Key project components/activities are identified for each project below:

Castlegate CBM Project

- Up to 124 new wells would be drilled and access roads would be constructed to each wellsite. Along the access roads, pipeline corridors would be constructed for the gas and produced water pipelines from the wells, electrical lines to the wellsites, and high-pressure gas from the compressor facility to each well.
- The high-pressure gas would be used in a gas-lift system to lift the produced water from the coal seams.
- Three central processing facilities would be constructed to provide both gas and water treatment capabilities.
- Gas would be treated to remove water, remove carbon dioxide (CO₂), and be compressed for delivery into a

gas sales pipeline 13.8 miles long, which would connect with an existing interstate pipeline.

- The produced water would be treated to reduce its dissolved solids content so it can be discharged to surface streams. Water treatment would consist of passing 80 percent of the water through an electrodialysis or reverse osmosis process to reduce the dissolved solids content. The remaining 20 percent of the water would be discharged to an evaporation pond, and then pumped to an underground injection well for disposal.
- Project facilities would have electrical power from a new substation adjacent to the Utah Power and Light transmission line that crosses the Project Area.
- Permanent abandonment and reclamation of each individual well location in the event that the well is deemed to be commercially non-productive.

Full implementation of the proposed action would result in 824 acres of surface disturbance; 573 acres or 70 percent would be short-term, and would be reclaimed immediately following construction. Interim reclamation would include a portion of each wellpad, substation, road/pipeline corridors, and the entire sales pipeline ROW. The rest of the surface disturbance (251 acres or 30 percent) would remain for the life of the project (25 to 30 years). Areas committed to long-term industrial use would include: (1) road/pipeline corridors; (2) a portion of each wellpad; (3) the substation; and (4) the three central processing facilities.

Matt's Summit CBM Exploration Project

- I. Drilling of six production wells and one injection well.
- II. Construction of approximately 12,950 feet of new road necessary for access to the wells proposed for drilling by Anadarko in the Matt's Summit project area.
- III. Reconstruction of approximately 12,900 feet of existing access road to the Matt's Summit State A-1 which was previously authorized by the BLM under ROW grant UTU-67355.
- IV. Reclamation consistent with the level of operations expected on each individual well location during evaluation of the coalbed reservoir.
- V. Installation of a water gathering and disposal system consistent with the preferred method of water disposal. The water gathering/disposal system would involve the installation of approximately 35,477 feet of buried pipeline and 1,750 feet of surface pipeline.
- VI. Permanent abandonment and reclamation of each individual well location in the event that the well is deemed to be commercially non-productive.

Full implementation of the proposed action would result in 42 acres of surface disturbance within the roughly 10,000-acre Matt's Summit project area.

Helper CBM Pilot Project

- I. Construction, drilling, and completion of five production CBM wells and one injection well
- II. Construction, drilling and completion of one water disposal well in Township 14 South, Range 10 East of Carbon County, Utah
- III. Construction and/or reconstruction of approximately 7,386 feet (total) of access road to the five proposed well locations
- IV. Installation of a natural gas compression facility at the water disposal well location
- V. Interim reclamation of those areas disturbed in association with initial wellpad, access road and pipeline construction
- VI. Final reclamation of those remaining disturbed areas upon project abandonment

Full implementation of the proposed action would result in 43 acres of surface disturbance within the approximately 3,200 acre Helper project area. Construction of wellpads and access roads would total approximately 25 acres of disturbance; pipeline installation would disturb approximately 18 acres. Approximately two acre-feet of fresh water would be required for project implementation.

Grimes Wash CBM Pilot Project

- I. Construction, drilling, and completion of five CBM wells in Township 18 South, Range 7 East of Emery County, Utah; one well located in Section 10 (completed in 1995) and four additional wells planned for Sections 4, 8, 9, and 10
- II. Construction or upgrade of an estimated 4.5 miles of road and adjacent, paralleling pipelines/utility facilities
- III. Interim reclamation of those areas disturbed in association with initial wellpad, access road and pipeline construction
- IV. Final reclamation of those remaining disturbed areas upon project abandonment

Full implementation of the proposed action would result in an approximate total of 18 acres of surface disturbance. The disturbance acreage would be equally attributed to the five well pads (9.2 acres, approximately 1.8 acres per well pad) and the 4.5 miles of ROW (8.4 acres). One to two D-8 sized bulldozers with operators, a road grader and operator, and a fencing crew would be employed over approximately a one week period to construct well pads and transportation systems. The drilling of wells using standard drilling techniques and equipment would take from one to four weeks per well.

Buzzard Bench Project

- I. Construction, drilling, and completion of 13 CBM wells and four non-CBM gas wells in the southern half of Township 18 South, Range 7 East and the northeastern corner of Township 19 South, Range 7 East, Emery County, Utah
- II. Construction or upgrade of an estimated nine miles of road and adjacent, paralleling pipelines/utility facilities
- III. Construction, drilling, and completion of one injection well for the disposal of produced water; the well has been approved but is not yet in use
- IV. Interim reclamation of those areas disturbed in association with initial wellpad, access road and pipeline construction
- V. Final reclamation of remaining disturbed areas upon project abandonment

Full development of these facilities would result in an approximate total of 42 acres of surface disturbance comprised of 20 acres of road and 22 acres of well pad disturbance. Well pads would be constructed to a one to two percent slope to drain spills and rainwater into a reserve pit (30 feet by 20 feet by 8 feet). Each 1.25-acre well pad would be bermed and ditched to prevent water from entering and exiting the pad. The wells would be drilled to a depth of 3,135 to 3,250 feet below ground level into the Ferron Sandstone using standard air-drilling techniques.

5.2.2 Proposed CBM Project

The other proposed CBM project yet to go through the NEPA compliance process is the Helper-Price CBM Project (Plate 26). This project is proposed as an expansion of the Helper CBM Pilot Project. The 64 proposed additional production wells surround the completed five pilot wells to the east, south, and west.

Key project components/activities for the Helper-Price CBM Project are identified below:

- I. Construction, drilling, completion, and stimulation of 64 additional CBM wells in the southern portion of Township 13 South, Range 10 East and the northern portion of Township 14 South, Range 10 East, Carbon County, Utah
- II. The proposed Helper-Price CBM project area straddles the EIS Project Area boundary just north of Price, Utah. Approximately 16 (25 percent) of the 64 proposed wells would be located within the EIS Project Area
- III. Proposed well locations approximate a 160-acre well spacing distribution
- IV. Construction or upgrade of approximately 35 miles of road and adjacent, paralleling pipeline/utility facilities
- V. Use of an existing injection well for the disposal of produced water
- VI. Use of an existing central production facility

VII. Interim reclamation of those areas disturbed in association with initial wellpad, access road and pipeline construction

VIII. Final reclamation of remaining disturbed areas upon project abandonment

Full development of the 64 additional wells would result in an estimated 396 acres of disturbance from the construction of well pads (228 acres), and road and adjacent pipeline/utility facilities (168 acres). Of the 64 proposed wells, 48 are located outside of the EIS Project Area, and are therefore not accounted for in the potential additional drilling development scenarios discussed in Section 5.2.3. Construction of the 48 wells and approximately 23 miles of road/road upgrade would effect a net additional disturbance of 282 acres. Development of the 64 wells and associated roads would be conducted over a three- to four-year period. Produced water would be piped to the existing injection well developed as part of the Helper CBM Pilot Project.

5.2.3 Potential CBM Projects

Potential projects include (1) the development of wells in remaining available well spacing locations within the EIS Project Area; (2) the development of CBM wells along the entire Ferron Fairway; and (3) the construction and operation of an additional interconnect transmission pipeline to transport CBM gas from areas south of the EIS Project Area to the main east-west Questar transmission pipeline.

Additional Drilling within the Price CBM EIS Project Area

The potential for drilling other available well locations is based on the presence of continuous CBM reserves throughout the EIS Project Area, as well as the existence of leases held by other oil and gas companies within the EIS Project Area. Additional drilling of areas not controlled by RGC within the EIS Project Area would result in an increase of wells, miles of transportation systems, and numbers of ancillary facilities (compressor stations, injection wells, and evaporation ponds) beyond those proposed for construction and operation under the Proposed Action and each of the project alternatives (Alternatives A, B1, B2, C1, C2, and No Action). The level of development associated with Alternative D is very similar to that of Alternative C1 - Security Areas Protection at 160-acre well spacing. However, the locations of restricted development are different. The cumulative impacts associated with Alternative D and potential additional drilling were estimated relative to the impacts with Alternative C1 and the Gordon Creek no development area.

Plates 28 to 34 present a potential distribution of well locations and transportation corridors should full development (i.e., all available well spacing windows are occupied by a well) occur under the limitations posed by the Proposed Action and the alternatives. Tables 5.2-1 through 5.2-7 present the numbers, miles, and acreages of facilities/disturbance for potential additional drilling in the Project Area, using the well spacing and siting constraints of each of the seven alternatives. Additional facilities that would be affected by raptor restrictions and winter closure are presented in Tables 5.2-8 and 5.2-9. The rate of consumption of sand and gravel and water in the construction and

development of additional wells, roads, pipelines, utilities, and ancillary facilities would be equal to rates presented for the Proposed Action and each of the alternatives described in Section 2.0. Sand, gravel, and water consumption by facility type is presented in Table 5.2-10.

Ferron Fairway

The Ferron Sandstone coalbed gas fairway (termed Ferron Fairway) is a six to 10 mile wide band extending more than 80 miles from north of the town of Price, Utah, to beyond Emery, Utah in the south (Plate 27). Ultimate recoverable gas reserves from the Ferron Fairway are estimated at between four and nine trillion cubic feet. Development of the entire 544,000-acre Ferron Fairway could support about 3,400 gas wells drilled on 160-acre centers. The shallower (1,000 to 4,500 feet deep) eastern side of the Ferron Fairway covers approximately 211,200 acres and could accommodate 1,320 gas wells. Deeper portions of the Fairway (4,500 to 9,000 feet) under the Wasatch Plateau and Book Cliffs cover about 332,800 acres, and could potentially support another 2,080 wells (Utah Geological Survey 1995).

The Ferron Fairway includes more than half of the EIS Project Area, and nearly all of the Drunkards Wash Unit. The estimated 3,400 gas wells in the Ferron Fairway at 160-acre spacing include wells that are part of the Proposed Action, and wells that are part of the Additional Drilling/Proposed Action scenario. In addition, all of Grimes Wash, Helper and Matt's Summit Projects, and about half of the Buzzard Bench Project are within the Ferron Fairway. Excluding the wells evaluated for those projects, there would be approximately 2,800 additional wells in the Ferron Fairway at 160-acre spacing

(or 5,600 wells at 80-acre spacing). The minimum estimated disturbance resulting from these wells at 160-acre spacing would be:

- I. 3,020 acres for wellpads (assuming 1.4 acres per well pad)
- II. 11,600 acres of construction disturbance for transportation corridors (assuming one-half mile per well [1,400 miles total] and a 77-foot wide transportation corridor)
- III. About 300 to 400 acres for compressor stations, injection wells, and evaporation ponds

The BLM will be preparing an EIS to analyze in detail the potential effects of CBM development within portions of the Ferron Fairway. The Ferron Natural Gas EIS would include two areas adjacent to the EIS Project Area; north of Price and south to approximately Ferron. The proposed development would involve approximately 375 wells at 160-acre well spacing and related production facilities; 125 miles of roads and pipelines, and a 40-mile transmission gas pipeline. Public scoping meetings were held in February 1997.

North-South Interconnect Pipeline

Development of the CBM gas reserves of the Ferron Fairway would require construction of a new natural gas pipeline to link all of the various CBM projects with the existing Questar pipeline system for sales and transportation. It is assumed that this gas pipeline would be approximately 20 inches in diameter, and would extend from the southernmost extent of CBM development to the vicinity of the EIS Project Area. It could be located anywhere in the CBM trend, but would most likely be located near Utah State Highway 10. There would be approximately 64 miles of pipeline and approximately 640 acres of disturbance, assuming a 75-foot wide construction ROW and ancillary facilities such as compressor stations and metering sites. Construction methods would be similar to those described in Section 2.2.2.3. Disturbance would be mostly short-term because reclamation and revegetation would be initiated at the end of construction.

5.2.4 Other Projects

Proposed Power Plants

Hunter Unit IV. Utah Power and Light (UP&L) proposed an additional generating unit at the Emery Power Plant located south of Castle Dale, Utah. In 1979, the BLM prepared an EIS analyzing the additional unit. UP&L has since withdrawn their permit application with the Utah Division of Air Quality. Hunter Unit IV is no longer considered a reasonable foreseeable future action, and is not included in the cumulative impacts analysis.

Hiawatha Co-generation. This proposed project at the western edge of the EIS Project Area involves coal gasification and power generation. The Utah Division of Air Quality is currently reviewing a permit application for the project. The major air quality issue is sulfur dioxide emissions (Blanchard 1996). Sulfur dioxide is not a pollutant of concern for the Price CBM Project, and therefore no significant cumulative impacts would be expected. However, sulfur dioxide emissions would contribute to regional haze.

Proposed and Potential Coal Mines

Four new coal mines have been proposed in the general vicinity of the EIS Project Area, of which one is under construction. The locations of these mines are shown on Plate 27. Three are located along the Book Cliffs north and east of the EIS Project Area, and one (Blue Blaze) is located a few miles northwest of the EIS Project Area. These four mines would disturb about 252 acres, including both the mine sites and the roads which would be built or improved to provide access to the mines. Available information about each mine is summarized below:

I. **Willow Creek Mine.** Owner/proponent: Cyprus Plateau Mining Company. This underground mine located at an old mine site would result in an estimated 20 acres of surface disturbance. The mine is currently under construction and has road access located along Highways 6 and 191. No new employment is expected, since workers will transfer from other mines. The surface land ownership is private. The access roads are a combination of existing state roads or on private property.

II. **Dugout Canyon Mine.** Owner/proponent: Soldier Creek Mining Company. This underground mine would require eight miles of access road, disturbing approximately 140 acres for the road and ancillary facilities. About 10 acres would be disturbed for the mine. The surface land ownership is private. Access roads would consist of existing state roads with new access roads across federal lands and private property.

III. **B Canyon Mine.** Owner/Proponent: British Petroleum Coal Company. This underground mine would require 3.5 miles of upgraded access road disturbing approximately 62 acres. An estimated 10 acres would be disturbed for the mine. Approximately 40 to 50 new employees would be hired. The surface land ownership is mostly public land managed by BLM.

IV. **Blue Blaze Mine.** Owner/proponent: Horizon Coal Corporation. This underground mine currently has an access road. Approximately 10 to 20 acres would be disturbed for the mine. Approximately 40 to 50 new employees would be hired. The surface land ownership is private.

V. **Horse Canyon South.** According to UDOGM, this underground coal mine was active in the early 1980's and closed around 1984. The case lease is still valid, however, there are no proposals to develop the mine. The area is currently permitted for reclamation. If this mine were to become active again, it is assumed that approximately 20 to 30 acres of the former mine site would be re-disturbed; approximately 200 employees would be hired, and the existing roads would be upgraded. The surface land ownership is federal.

Community Expansion

Seven subdivisions in or near the EIS Project Area have been approved in Carbon County, but have not yet been developed. Available information provided by Carbon County Building and Planning Department about these areas is presented below.

I. **Rosewood Estates.** South of Wellington. Approved in 1996. Nine lots, 65 acres.

II. **Circle K Subdivision** Phase IIIA.

South of Price. Approved in 1996. 17 lots, 28 acres.

III. **South Meadows.** South of Price. Approved in 1996. Plat A: nine lots, 13 acres. Plat B: 27 lots, 30 acres.

IV. **Leavitt's.** Near Price. Approved in 1996. Eight lots, 40 acres.

V. **Westwood Phase IIIA.** Near Price. Approved in 1982. Six lots, 25 acres.

VI. **Broken Mesa.** Near Price. Approved in 1995. Nine lots, six acres.

VII. **O'Brien.** Near Price. Approved in 1996. 12 lots, two acres.

Future Logging

Logging could take place in the future on state and private land near the EIS Project Area. Potential logging areas that could impact resources also affected by the Price CBM Project include: private lands on the Wasatch Plateau west of Hiawatha and Wattis (headwaters of Cedar and Miller Creeks); private and state lands northwest of the EIS Project Area (headwaters of the North Fork of Gordon Creek); and private and state lands north of the EIS Project Area within the watershed of the Price River.

Narrows Dam Project

The U.S. Bureau of Reclamation is currently preparing a Draft EIS on this proposed project. The purpose of the project is to develop an additional supply of municipal water to support population growth in north Sanpete County, Utah. The proposed Narrows Dam would be located in the Upper Price River drainage basin between the lower Gooseberry Reservoir and the Fairview Lakes. The reservoir capacity would be approximately 17,000 acre-feet, and the project would divert 5,400 acre-feet per year from the Price River basin to the San Pitch River basin. This would create a depletion in the Price River drainage of approximately 600 acre-feet per year. The Price River Water Users Association has entered into a contractual agreement to allow the transbasin transfer to occur (U.S. Bureau of Reclamation 1996).

5.2.5 Projects Evaluated for Air Quality Cumulative Impacts

In discussions with the USEPA and the UDAQ, it was determined that the following projects would be considered for the air quality cumulative analysis.

Hiawatha Co-generation. Refer to the description in Section 5.2.4. This is the only proposed project to be included and, as described in the Air Quality Technical Support Document (WCC 1997), the Hiawatha co-generation project is currently comprised of the American Syngas project and the Carbon County co-generation project. Each of these projects result in an NO_x emission rate just slightly higher than one of the proposed RGC compressor stations with three compressors.

Questar Pipeline, Dew Point Plant. This is an existing compressor station, and is a

relatively small source of NO_x, emitting the equivalent rate of just less than two of the proposed RGC compressor stations.

Sunnyside Co-generation. This is an existing co-generation project that emits slightly more than all of the compressor engines associated with Alternative A, the largest development alternative.

Other Coal-fired Electric Generating Stations. Other sources included in the analysis are coal-fired electric generating stations that contribute a large quantity of pollutants to the region. Alternative A would result in a total of 173 lb/hr NO_x emissions. The total of the coal-fired electric generating plants is almost 100 times greater at over 17,000 lb/hr. The facilities considered in the cumulative analysis include:

- I. Pacific Corp, Carbon Plant
- II. Pacific Corp, Hunter Plant
- III. Pacific Corp, Huntington Plant
- IV. Deseret - Bonanza

The ongoing and proposed CBM projects, described in Section 5.2.1, were not evaluated for air quality cumulative impacts. The construction and operation plans for these CBM projects were not available for this analysis. The air quality analysis typically uses a sequential screening process, refining the assumptions and modeling accuracy until regulatory compliance is assured. Using a range of assumptions that for the CBM projects would have ranged from all electrically driven compressors resulting in only construction-related emissions to all natural gas-fired compressors likely to result in an exceedance of the Class IV increments is counter productive.

The sequential screening process requires defined project inputs, which, at the time of this analysis, were not available for the potential CBM projects.

5.3 CUMULATIVE IMPACT ASSESSMENTS

Based on the conclusions on direct and indirect impacts analyzed in Chapter 4.0, there is a potential for significant cumulative impacts for the following resources: water, air, soils, wildlife, recreation, visual and socioeconomics. Cumulative impact assessments are presented below for the projects and resources summarized in Table 5.1-2.

5.3.1 Water Resources

Cumulative impacts of concern on water resources relate to consumptive use and coal seam dewatering from CBM development; groundwater flow interception from coal mines; consumptive use from subdivision development; sedimentation from logging activities, and diversion of water from the Price River drainage for the Narrows Dam project.

Ongoing, Proposed and Potential CBM Projects

Coal Seam Dewatering. There is a potential for cumulative impacts on the water resources of the Ferron Sandstone from dewatering associated with CBM development. The number of production wells under the potential Additional Drilling/Proposed Action scenario and the other CBM projects that produce from the Ferron coals would be 1,116 wells, which is a 66 percent increase over the EIS Proposed Action. The most production wells would be associated with the Additional Drilling/Alternative A and other CBM projects scenario, totaling approximately 2,345 wells. This would be approximately three times as many wells as for the EIS Proposed Action. It is difficult to calculate the volume of water that would be produced from individual wells under the different scenarios due to the combined drawdown effect between two or more wells, and the unsteady water production rate during a well's lifetime. However, assuming similar water production rates as anticipated for the Proposed Action, the volume of water withdrawn from the Ferron coals would increase proportionally with the number of wells. Water would also be withdrawn from the Blackhawk coals as part of the Castlegate and Matt's Summit Projects. The Blackhawk formation is part of the Mesaverde aquifer and stratigraphically overlies the Mancos Shale. The Blackhawk formation does not exist within the EIS Project Area, and in the surrounding area is separated from the Ferron Sandstone by some 4,000 feet of Mancos Shale. Therefore, there would be no potential that the withdrawal of water from the Blackhawk Formation would have any cumulative impact on the water resources of the Ferron Sandstone. As discussed in Section 4.2.1.1, the poor water quality and depth of the Ferron Sandstone renders the water within it

uneconomical for most uses. As for now, the only beneficial use for this water is the recovery of the CBM resource. Therefore, the cumulative production of water from the Ferron Sandstone is not considered a significant impact to the quantity or quality of the water in the coal seams.

Disposal of the waters resulting from coal seam dewatering has the potential to impact the water resources of the Navajo-Nugget Aquifer. The disposal of produced water resulting from the Proposed Action, ongoing and proposed projects, and potential additional drilling within the EIS Project Area is estimated to require at least 16 injection wells; two times as many as would be needed for the EIS Proposed Action. The Additional Drilling Alternative A and other CBM projects scenario would potentially require the most injection wells totaling 23 wells. Assuming each of these injection wells would carry a maximum of 10,000 BWPD, and that they are all positioned in the immediate vicinity of the Project Area, then no adverse cumulative impacts to the water quality of potable portions of the Navajo-Nugget aquifer would be anticipated. This aquifer is not an important water source in the EIS Project Area because of its poor water quality and great depth. The ongoing Castlegate and Matt's Summit projects inject their surplus produced waters into the Spring Canyon Sandstone Member of the Star Point Formation. This formation is not found within the EIS Project Area (USGS Map of Price Quadrangle).

The risk of causing water quality degradation in the non-potable portions of the Navajo-Nugget Aquifer as a result of injecting produced waters is considered to be low even if all the proposed and reasonable foreseeable projects were developed. Negative impacts to the water quality within the Navajo-Nugget aquifer are

not expected to occur since the quality of the injected water is typically much better than that of the Navajo-Nugget Aquifer. Additionally, management of the injected water under the UDOGM UIC Permit process should prevent any adverse impacts to the quality of the groundwater resources.

Water Use. The ongoing, proposed and potential projects that are part of this cumulative analysis would all likely require water for well drilling and stimulation, and construction of roads, well pads, evaporation ponds and compressor stations. Water would also be consumed for dust suppression by either direct application or associated with magnesium chloride application. No volume estimates are available for water use requirements; however, based on the number of wells, the cumulative water requirements could exceed the Proposed Action estimates by as much as 60 percent. However, due to the staged development of drilling and stimulation of wells, construction of roads, etc., fresh water demands should not increase significantly at any one time. It is assumed that all future developers would have to enter into an agreement with PRWID or the appropriate community or irrigation district to purchase or lease water as discussed in Section 2.2.2. It is the responsibility of the Utah Department of Natural Resources, Water Rights Division to regulate the use of water in the state of Utah. The Water Rights Division would evaluate on a case-by-case basis with any developer filing a change of use application based on the prior consumptive use. Therefore, the cumulative use of water for the ongoing, proposed CBM projects, potential additional drilling within the EIS Project Area, and the Proposed Action should not result in any

significant impact to available water sources, although substantial changes in water use type would occur, primarily from agriculture to industrial use.

Protection of water resources under any of the alternatives is largely reliant upon appropriate construction techniques and implementation of effective environmental protection measures. These measures would likely be implemented regardless of which alternative is selected; however, the potential for adverse impacts to occur due to the failure of one or more of these measures increases proportionally with the magnitude of the project. Therefore, the potential for significant cumulative impacts to water resources to occur is highest for Additional Drilling/ Alternative A and lowest for the No Action alternative.

In summary, the ongoing or proposed CBM projects in the area, the potential additional drilling within the EIS Project Area, and the Proposed Action are not expected to result in any significant impacts to the water resources of the area.

Ferron Fairway. Another potential CBM project considered in this cumulative analysis is the development of the Ferron Sandstone gas fairway (Ferron Fairway). As this is only a potential project, very little quantitative information is available on how this type of project would take shape. Therefore, this analysis is restricted to the potential components of the project that could result in an impact to the water resources of the area. Assuming that production and disposal volumes in this expanded area would be similar to that observed with the Proposed Action, it is

estimated that an additional 2,800 production wells would be developed at a 160-acre spacing. This number of production wells may require as many as 30 additional injection wells to dispose of the production water and could result in as much as 15,000 acres of additional surface disturbance.

This potential project could result in approximately twice the acreage of disturbance and number of production and injection wells that are currently anticipated for the Additional Drilling/Alternative A scenario. Additionally, development of the Ferron Fairway would require construction of a new natural gas pipeline to link all the various projects to allow for transportation and sales. This pipeline network would require approximately 640 acres of surface disturbance to construct. If the Ferron Fairway were developed in a similar manner to what has been described for the Proposed Action, the potential for significant impacts to the water resources of the area is high. These activities could: (1) potentially result in significant degradation of surface water quality due to the amount of surface disturbance for drillpads, pipelines and roads, (2) result in water disposal problems as suitable aquifers such as the Navajo Sandstone may not have the injection capacity to handle the required volumes, (3) reduce flow of streams and springs where the Ferron currently discharges south of the Project Area in Emery County; and (4) increase water shortages as significant additional volumes of fresh water would be required for drilling and operation of such a project.

Other Projects

Other projects in the vicinity of the EIS Project Area that could contribute to cumulative impacts to water resources include proposed and potential coal mines, expansion of residential communities, future logging, and the construction and operation of the proposed Narrows Dam.

Proposed/Potential Coal Mines. Very little information is available regarding the proposed and potential coal mines in the area other than the general location and probable area of surface disturbance. A total of 262 acres of surface disturbance is anticipated for road construction and mine facilities. Assuming that all the projects would be developed as underground mines, there would be little potential for the diversion of significant volumes of surface water. Surface water quality could potentially be degraded due to erosion and sediment runoff from construction activities; however due to the comparatively small acreages of disturbance and significant distance from the EIS Project Area, there would be little potential for cumulative impacts to surface water quality.

Groundwater would likely have to be pumped from the coal mines in order to dewater the underground excavation and allow access. It is not known at what depths or which specific

coal formations would be mined. However, based on the location of the mines, it is unlikely that the dewatering of the coal mines would intercept and have a cumulative impact on the water withdrawal from the Ferron Sandstone.

Community Expansion. Available information suggests that as many as 70 new lots could be

developed within seven new housing developments located within or near the Project Area. Assuming a per capita water use of 100 gallons/day and an average inhabitation of 3.5 people per lot, the consumptive use of potable quality water could increase by as much as 24,500 gallons/day (275 ac-ft/yr). This water use represents only 0.4 percent of the total municipal water use for Carbon and Emery Counties. Therefore no significant impact to water resources would be expected as a result of these housing developments; however, any new use of water resources would require that a shift in existing water usage. It is the responsibility of the Utah Department of Natural Resources, Water Rights Division to regulate the use of water in the State of Utah.

Future Logging of State and Private Land.

Very little information is available on the magnitude and location of future timber harvests, except that it is likely that such logging would occur in the headwaters of Cedar and Miller Creeks, headwaters of the North Fork of Gordon Creek and within the watershed of the Price River. Impacts to surface water resources from increased sedimentation have their highest potential to occur soon after felling of the trees. These impacts should not be significant if crossings of perennial reaches of streams are minimized during any new road constructions and if felling maintains a buffer zone on either side of the streams. However, some minor increases in suspended solids and TDS concentrations would be expected in the short- to mid-term until the logged areas are revegetated. No significant cumulative impact to surface water quality or flow is expected as a result of the potential future logging.

Narrows Dam Proposed Project. According to the U.S. Bureau of Reclamation, approximately 600 ac-ft/yr would be depleted for the Narrows Dam project from the Price

River drainage basin. The Price River Water Users Association has entered into water rights agreements to allow the transbasin transfer to occur. The Narrows Dam project was sized to avoid impacts to the Users Association. There should be no cumulative impact to Price River water use regardless of whether the Narrows Dam project is built.

5.3.2 Air Quality

The impact of existing projects is reflected in the background ambient air quality in the EIS Project Area and in the NAAQS analysis (see Section 4.3.2). Cumulative impacts to air quality arise from the interaction of emissions from the Proposed Action (or alternatives) and the interacting sources.

The primary operational impacts of the proposed project and alternatives would result from emissions of pollutants from the operation of natural gas-fired compressor engines. Based upon dispersion modeling conducted for the Proposed Action and alternatives, operation of a typical CBM compressor station would not result in significant air quality impacts.

Emissions of pollutants from the interacting sources would contribute to regional haze and reduced visibility. The majority of this impact, however, is attributed to the coal-fired power plants in the region and is already affecting visibility in the area. It is unlikely the impact from the RGC Proposed Action would be discernible.

5.3.3 Soils

The cumulative impacts analysis for soils resources includes five CBM exploration and development projects in the vicinity of the EIS Project Area; the proposed expansion of Helper CBM Pilot Project; and potential future development in the EIS Project Area. In addition, reasonable foreseeable actions including development of the Ferron Fairway CBM gas reserves and the Questar Pipeline System would potentially impact soils resources. These projects have disturbed or would disturb soils with similar characteristics as those in the EIS Project Area. Therefore, impacts to soils from construction and operation activities would be similar to those described in Section 4.4. Long-term impacts include removal of vegetation, exposure of the soil, mixing of soil horizons, soil compaction, loss of topsoil productivity, and increased susceptibility of the soil to erosion. These impacts could increase runoff, erosion, and off-site sedimentation of saline soils.

a) Soils impacts associated with each of the projects is as follows:

b) **Ongoing CBM Projects**

- I. Castlegate CBM Project - Short-term impacts to 824 acres would be reduced to 251 acres of long-term impacts following interim reclamation. Of this total, 41 acres have a high erosion potential. Disturbance of saline soils was not analyzed in the EIS for the Castlegate Project. However, according to the soil survey (USDA, SCS 1988), none of the soils rated high for erosion potential are highly saline.
- II. Helper CBM Pilot Project - Short-term impacts to 43 acres would be

reduced to approximately 6 acres following interim reclamation. None of the soils impacted have a high erosion potential nor are they highly saline.

Detailed, quantitative soils information was not available for the following existing and proposed projects, but the regional soil surveys provide general information, as noted below.

- I. Matt's Summit CBM Exploration Project - Full development of this project would disturb 42 acres in the short-term. Long-term impacts after reclamation would affect 12 acres. Soils are shallow to very deep loams and clay loams on the lower slopes less than 30 percent. Soils on the steeper slopes are moderately deep, bouldery, sandy loams. For all of these soils, the potential for erosion is moderate, salinity is low, and they are rated fair to good for use as reclamation material (USDA, SCS 1988).
- II. Grimes Wash CBM Pilot Project - Implementation of this project would result in 18 acres of disturbance, most of which is likely to be long-term. Most of the soils in the project area are deep, stony, sandy loams, on 0-20 percent slopes. The erosion potential is slight to moderate, and the soils are slightly to moderately saline. Sheet erosion is active. Rockland is also prominent in this area. It is barren rock and shale on steep slopes that are moderately to severely eroded (USDA, SCS 1970).
- III. Buzzard Bench Project - Full development of this project would result in 42 acres of disturbance. Again, most of this is assumed to be long-term. Soils in this area are similar to those of the

Grimes Wash area, but also include badlands - barren, actively eroding shale on steep slopes. Other soils in the area include loams and silty clay loams on 0-20 percent slopes. The potential for erosion is moderate, but rill and gully development and sheet erosion are active. These soils are slightly to strongly saline (USDA, SCS 1970).

Proposed CBM Project

- I. Proposed Expansion of the Helper-Price CBM Pilot Project - Full development of the Helper project would result in 396 acres of disturbance. Soils in the project area are similar to those in the northeast EIS Project Area, north of Price. In general, they are loams, silt loams, and sandy clay loams on nearly level to gently sloping hills. The potential for erosion is moderate, and salinity is low for most of the soils. Most of the soils would also be rated fair for use as reclamation material. Strongly interspersed throughout this area are both badlands and rock outcrops on steep slopes (USDA, SCS 1988).

In summary, full development of these ongoing and proposed projects would disturb 1,365 acres in and around the EIS Project Area. These soils have characteristics similar to those described in Section 3.4. Generally they are loams and sandy loams on nearly level to moderately steep slopes. The potential for erosion is moderate, salinity is low, and the soils are rated fair to good for use as reclamation material. These soils would not fall within the sensitive soil

categories.

It is assumed standard, best management practices to control erosion and sedimentation, and monitoring or revegetation efforts with retreatment as necessary would be implemented on all of these projects. Therefore, cumulatively, impacts to soils could be kept to non-significant levels.

Potential CBM Projects

Additional Drilling Scenarios. Additional cumulative impacts to the soils resource would occur within the EIS Project Area if all remaining available well spacing locations were developed as discussed in Section 5.2.3. The potential additional drilling within the EIS Project Area would result in impacts similar to those described for the Proposed Action; however, the magnitude of the impacts would be greater.

Implementation of the EIS Proposed Action would result in the disturbance of 2,512 acres of sensitive soils (Table 4.4-1). Should additional drilling within the EIS Project Area occur, another 1,489 acres would be disturbed. About 45 percent of this additional development would occur on the eastern part of the EIS Project Area where soils have a moderate to high erosion potential, salinity is high to very high, and the material is rated poor for use as reclamation material. The remaining 55 percent of additional drilling would occur primarily in soils not considered sensitive. Thus, cumulatively, impacts from the Proposed Action and potential additional drilling would affect about 3,182 acres of sensitive soils in the region. This would be approximately a 27 percent

increase in impacts to soils compared to the Proposed Action.

To reduce potentially significant impacts, the same environmental protection measures to control erosion and sedimentation, discussed in Section 4.4, would have to be applied at a much larger scale. Additionally, a 27 percent increase in reclamation, revegetation, and monitoring efforts would be necessary.

Development of Alternative A in conjunction with impacts from potential additional drilling would result in the greatest amount of disturbance. As with the Proposed Action, approximately 45 percent of additional development would occur on sensitive soils. Cumulatively, this would affect approximately 5,182 acres of sensitive soils requiring the same environmental protection measures and reclamation as discussed under the Proposed Action. This would more than double the impacts to sensitive soils compared to the Proposed Action.

Of all the alternatives, Alternative B1 would result in the least amount of impacts. Approximately 50 percent, or about 631 acres, of potential additional drilling would occur on sensitive soils, with cumulative impacts affecting about 2,955 acres. This would amount to a 18 percent increase in impacts compared to the Proposed Action. The same environmental protection measures discussed previously would apply.

As above, about 50 percent of the additional development for Alternative B2 would result in impacts to sensitive soils, with cumulative impacts affecting about 4,798 acres. Comparatively, this is a 91 percent increase in impacts to soils relative to the Proposed Action. The same environmental protection measures discussed previously would apply.

For Alternatives C1, C2, and D, about 50 percent of the potential additional drilling would impact sensitive soils. Cumulative impacts would affect 3,153 acres, 5,140 acres, and 3,087 acres, respectively. This would be a 26 percent increase in impacts compared to the Proposed Action for Alternatives C1 and D, and 105 percent for Alternative C2. The same environmental protection measures discussed previously would apply.

Under the No Action alternative, approximately 65 percent of the potential additional drilling would impact sensitive soils. Cumulative impacts would affect 1,940 acres which would be an 23 percent decrease in impacts compared to the Proposed Action. The same environmental protection measures discussed previously would apply.

Ferron Fairway. Development of the CBM gas reserves of the Ferron Fairway would result in at least 15,020 acres of additional disturbance in the proposed EIS Project Area. Soils throughout the Ferron Fairway are similar to those described in Section 3.4. The southern half of the Fairway has soils similar to those previously described for Emery County. A soil survey is not available for the portion of the Fairway that lies within the Manti La Sal National Forest. However, shale outcrops and natural landscape features such as relief and drainage patterns suggest that much of the southwestern portion of the Ferron Fairway has soils similar to those described for the Rock Land-Shaly Colluvial Land-Castle Valley-Kenilworth association (USDA, SCS 1970). Very steep to perpendicular sandstone with little to no soil material make up about 60 percent of the association. Shallow to deep soils on gently sloping to steep benches make up the other 40 percent. The susceptibility of these soils to erosion is moderate to high, and they are not

saline. Construction and development of a CBM project on the Ferron Fairway could be expected to have impacts to the soils resource similar to those described for the Proposed Action, and erosion control measures would be necessary to minimize soil loss and sedimentation.

Questar Pipeline System. Construction of a pipeline linking all of the CBM projects in the Ferron Fairway would disturb approximately 640 acres. Short-term impacts to the soils resource would, again, be similar to those described for the Proposed Action. Mitigation measures to control erosion, as described for the Proposed Action, should be implemented for any new project in the area.

Cumulative Assessment

Should all of the proposed and reasonable foreseeable projects be developed, 18,683 to 21,305 acres of the soils resource would be impacted. Though these are not all necessarily sensitive soils, a high percentage of soils in this region are susceptible to erosion, and in fact, many areas are currently undergoing a high rate of accelerated erosion. Soils in this region also tend to be saline. Impacts would include the loss of top soil, rill and gully development, and increased sediment and salt loads of stream channels and rivers as a result of erosion. The rigorous implementation of erosion control measures and effective reclamation efforts would minimize potential impacts to soils, and would bring erosion and salt delivery rates to within the range of natural rates for the Project Area.

Development of all of these projects would not

be likely to result in significant cumulative effects to regional soils. The majority of the Ferron Fairway is federal land, and will be subject to requirements for erosion control and revegetation similar to those applied to the Price CBM Project and described in this EIS. In addition, the projects would affect a relatively small portion of the land within the area, and impacts would be dispersed throughout the area. For example, the RGC Proposed Action would affect only about 2.1 percent of the soils in the EIS Project Area. The Additional Drilling/ Proposed Action alternative would occur within the boundaries of the EIS Project Area, and would affect an additional 0.8 percent, or about 2.9 percent total. Development of CBM resources in all parts of the Ferron Fairway would affect about 18,683 to 21,305 acres of soils, but would occur over an area of over 600,000 acres. Over the entire Ferron Fairway, the ongoing, proposed, and potential projects would therefore affect about 3 to 3.5 percent of the area.

5.3.4 Wildlife

The primary cumulative impacts of concern are loss and fragmentation of big game habitat, primarily from displacement and loss of habitat value. Projects evaluated for cumulative impacts on wildlife include other CBM projects, new coal mines, community expansion, and logging.

The projects would affect several different deer and elk herd units, as shown in Table 5.3.4-1. The different herd units include different summer and winter ranges, and there would likely be only limited intermingling between different herds. Therefore, projects in one herd

unit would be unlikely to have adverse cumulative effects on the same animals or populations.

For the Northeast Manti Mule Deer, the Additional Drilling/Proposed Action alternative would affect an estimated 25 percent more critical winter habitat and about 30 percent more high value winter habitat, assuming that the additional drilling overlapped in time with the Price CBM Project. This would increase the area of reduced habitat value in mule deer winter habitat to about 24 percent of the critical winter habitat in the study area and 28 percent of the high value winter habitat. Additional Drilling/Alternative A would similarly increase impacts to about 30 percent of critical winter habitat and 35 percent of high value winter habitat. Since the Price CBM study area makes up a large portion of the Northeast Manti winter range, these impacts would reduce overall winter carrying capacity, and cause proportionate decreases in the mule deer population. Impacts from additional drilling under the Additional Drilling/Critical Areas Avoidance, Additional Drilling/ Security Areas Protection, Additional Drilling/Alternative D, and No Action alternatives would have similar effects, but would be lower in magnitude. These alternatives would provide secure areas where wintering elk and other wildlife would not be disturbed. Under the Additional Drilling/Proposed Action and Additional Drilling/Alternative A alternatives, development would occur throughout the winter habitat.

The Ferron Fairway within the Northeast Manti deer herd unit largely overlaps with the EIS Project Area, except in higher elevation areas west of Hiawatha and near Helper. This additional development would mostly occur in mule deer summer range. Summer habitat is not limiting for the Northeast Manti herd, and

development of these areas would therefore have minor cumulative impacts in conjunction with the Price CBM Project. Migration routes from summer to winter habitat could be adversely affected.

The other projects within the Northeast Manti deer herd unit would also have minor cumulative effects with the Price CBM Project. Only a small portion of the potential Questar pipeline would be located within this herd unit. The most likely location along Highway 10 is in limited value yearlong habitat, which is unlikely to adversely affect deer populations. In addition, impacts would be short-term. The Blue Blaze coal mine would involve minor surface disturbance in summer habitat, and is located on an existing access road. The several community developments within this herd unit are located in limited value yearlong habitat, and would affect relatively small areas. Logging projects at the higher elevations within this herd unit would affect summer habitat. Deer would be displaced from these areas during logging, but could be attracted to it during forest regeneration. Logging projects would be unlikely to adversely affect mule deer populations in the herd unit.

For the Manti elk herd, potential additional drilling in the Project Area would involve about 28 additional wells in critical winter range, mainly on the northern edge of the Project Area and in the area southeast of Hiawatha (Plate 28). An additional 56 wells would be located in high value winter habitat. The additional wells and roads would have a disproportionately large impact on elk because they are outside of the winter closure area, and would increase the area of displacement to about 50 percent of elk critical winter range in the Project Area. This is expected to have a corresponding effect on populations wintering in the Project Area, increasing to about 50 percent loss of the elk

wintering in the Project Area, and about 15 percent of the Manti elk herd. Impacts would be similar with Alternative A. Impacts from additional drilling under the Additional Drilling/Critical Areas Avoidance, Additional Drilling/Security Areas Protection, Additional Drilling/Big Game Corridors, and No Action alternatives would have similar effects, but would be lower in magnitude. These alternatives would provide secure areas where wintering elk and other wildlife would not be disturbed.

The Grimes Wash and Buzzard Bench projects, and about 60 percent of the Ferron Fairway outside of the Price CBM Project Area are also located within the Manti Elk Herd Unit. Grimes Wash and Buzzard Bench are mainly on BLM land. Most of the other portions of the Ferron Fairway south of the Price CBM Project Area would be located on the Manti-La Sal National Forest. About 30 to 35 percent of the Manti elk herd winters west of the area from Huntington to Emery, mainly within Manti-La Sal NF (Bates 1997), within the Ferron Fairway. Impacts to elk in this area were analyzed mainly based on the recently completed FEIS for Oil and Gas Leasing on Lands Administered by the Manti-La Sal National Forest (USFS 1992). The Reasonably Foreseeable Development Scenario analyzed in the EIS estimated that there would be 30 conventional oil and gas wells in the Manti North Division over the next 15 years, and 6 on in the Manti South Division, but did not include any CBM wells on National Forest lands. Stipulations applied to conventional oil and gas development in big game winter range included seasonal restrictions (no construction Dec. 1 to April 15), and threshold limitations which limit indirect

effects of development to either 1 percent (key winter range) or 10 percent (general winter range) of the management unit. The threshold limitations would greatly limit the extent of CBM development in these habitats. Large areas within key and general winter ranges have also been identified as No Surface Occupancy, because of limitations on development on slopes greater than 35 percent. Adverse effects on wintering elk populations would therefore not likely exceed 10 percent of the habitat, or about 3.5 percent of the overall Manti elk herd.

The combined effects of the Price CBM Project, additional CBM development in the Project Area, and development in the Ferron would therefore affect about 18.5 percent of the wintering habitat and population of the Manti elk herd unit.

The other projects within the Manti elk herd unit would have minor cumulative effects with the Price CBM Project. The potential Questar pipeline would be located within this herd unit, most likely along Highway 10. Pipeline construction along Highway 10 would be unlikely to adversely affect elk populations, and impacts would be short-term. The Blue Blaze coal mine would involve minor surface disturbance in summer habitat, and is located on an existing access road. The several community developments within this herd unit are located in limited value winter habitat, and would have minor or no cumulative impacts. Logging projects at the higher elevations within this herd unit would displace elk during logging activities, and may adversely affect summer habitat or migration corridors.

The additional drilling alternatives would also increase impacts to pronghorn antelope, black bear, moose, and mountain lion within the study area. Impacts to pronghorn antelope would be doubled for all additional drilling alternatives, and the other species would be displaced from much of their habitat in the EIS Project Area. Development of the Ferron Fairway would likely cause significant reductions in black bear and mountain lion along the eastern side of the Wasatch Plateau. Other projects would have minor cumulative impacts.

The other deer and elk herds listed in Table 5.3.4-1 would be unlikely to receive cumulative impacts directly relating to the Price CBM Project. However, development of the Ferron Fairway and the additional drilling alternatives would be likely to result in significant impacts in these herd units, and the projects may generate cumulative impacts among themselves. Additive losses among different herds may be sizable, and result in significant reductions in big game populations, habitat carrying capacity, and hunting opportunities.

5.3.5 Recreation

Cumulative impacts to open space would primarily affect the dispersed recreational opportunities and quality of recreational experiences possible on public lands within 30 to 45 minutes of Price and surrounding areas. The cumulative effects of the identified ongoing, proposed, potential and other projects would noticeably diminish the availability and aesthetic quality of public lands that are used for hunting, horseback riding, off-road vehicles, wildlife viewing, hiking and mountain biking. Impacts would be particularly evident between Price and Kenilworth, where a variety of informal recreational activities occur on a regular basis. The Carbon County Trails Plan identifies the Wood Hill-Kenilworth loop trail as a trail system that is currently widely used by recreationists from the local communities. The Butch Cassidy Blowout Course is also located in this area.

The attractiveness of this area for recreational development would be substantially reduced by the Helper-Price CBM Project and other existing disturbances such as electrical transmission lines, water storage tanks, and numerous antenna sites. A pilot project in this area resulted in the drilling of four CBM wells and one water disposal well.

The proposed Helper-Price project would develop an additional 64 CBM wells in this area, impacting the scenic quality, and generating dust, noise, and traffic impacts, especially during the construction phase of the project. Cumulative impacts on lands available for hunting would substantially increase competition amongst hunters in remaining areas to the east of Price.

5.3.6 Visual Resources

The cumulative impacts that could result from multiple project developments in the region and full buildout of the EIS Project Area would entail significant changes to natural landscape qualities and substantially affect the quality of views currently available to residents and visitors. Cumulative scenarios considered in this EIS for the Project Area are shown on Plates 28 through 34. Tables 5.2-1 through 5.2-7 identify the amount of disturbance expected with each alternative. Plates 26 and 27 shows the relationship of the Project Area to other potential projects.

Landscape Character

Cumulative impacts to natural landscape character and scenic quality could result from the buildout of the EIS Project Area and other projects shown on Plates 26 and 27. Cumulative impacts to landscape character would primarily occur in areas where the CBM facilities would coexist with other types of industrial developments. Due to the low profile and density of facilities associated with CBM development, cumulative impacts to landscape character would largely be limited geographically to the EIS Project Area and adjacent landscapes. Within this area, proposed and potential projects that would further change the character of the landscape of the EIS Project Area include the buildout of the EIS Project Area (i.e., additional drilling) and the proposed Helper-Price CBM Project and Helper CBM Pilot Project. Cumulative impacts would be most significant in the vicinity of Price and Kenilworth, where buildout of the CBM facilities in conjunction with the Helper Price CBM Project would effectively transform the existing natural open landscapes to a semi-industrial character. Due to the proximity of these natural public landscapes to these communities, and their use for a variety of open space dispersed recreational purposes, the visual impacts to landscape character are considered significant and potentially unmitigable. Additional drilling in the CBM Project Area and associated activities would similarly have a cumulative impact on landscape quality and character. Cumulative impacts would be significant in the eastern part of the EIS Project Area that provides wide-open and panoramic views of the surrounding landscape. Within this type of open landscape setting, the

potential additional drilling in the EIS Project Area would create a highly semi-industrial landscape due to its geographic extent and the influences on truck traffic, dust and noise, as well as the facilities.

In summary, on a regional level, cumulative impacts to landscape character and scenic quality would result in extensive changes to the landscapes directly affected by each of the proposed and potential projects. Impacts would be localized for each proposed project, however. Within the EIS Project Area, cumulative impacts to landscape character and quality are considered to be potentially significant due to the large geographic areas that would be transformed to a semi-industrial landscape. More remote proposed and potential projects, outside the EIS Project Area, would contribute to the regional loss of natural landscape values, but would not directly interact with effects caused by CBM developments within the EIS Project Area.

Visual Impacts to Viewers

Cumulative impacts to viewers will depend upon the degree to which the various proposed and potential projects may visually interact due to viewshed conditions created by topography and vegetation; and the degree to which different viewer groups may be affected, given their activities and location within the EIS Project Area. Table 5.3.6-1 is a summary comparison of the cumulative alternatives with respect to viewer impacts. Differences among the CBM cumulative alternatives are incremental, or a matter of degree, with all alternatives resulting in significant regional aesthetic impacts. The following summarizes the overall cumulative impacts to various viewer groups.

Local Communities. The communities of Price, Spring Glen/Carbonville, Elmo, and

Wellington would be affected primarily along residential edges and/or on higher elevations where open and elevated views towards the cumulative project developments occur. Rural and dispersed residential areas, including the 7 proposed subdivisions, and dispersed residences along Gordon Creek Road, and areas south and west of Price and west of Elmo would be affected. In these areas, foreground and middleground views would be transformed from agricultural or natural open space settings to views of semi-industrial landscapes. These impacts would be significant for all the cumulative alternatives, but greater for Alternatives A, B2, and C2 which would permit 80-acre well spacing, rather than 160-acre well spacing. The significance of impacts would result from the presence of roads, truck traffic, operating wells, and the related loss of views to natural landscapes and wildlife. These types of impacts would also result in any other residential areas that are within the foreground to middleground distance zones of CBM facilities and activities.

Recreation Areas. Cumulative visual impacts to developed and dispersed recreation areas would result from additional CBM drilling and from the Helper-Price CBM Project and Helper CBM Pilot Project. Public lands, currently existing and within view of the recreational trails north of Price and trails included in the County's trails plan, provide aesthetic landscape qualities, serenity, and wildlife viewing opportunities that would be displaced or significantly altered by the cumulative EIS project developments. Under the cumulative project scenarios, the views from, and quality of experiences afforded in, these natural landscape areas would be lost long-term.

Roadways. Travelers along State Highway 6/191 and Highway 10 would experience

cumulative visual impacts from project developments shown on Plates 26 and 27. Travelers along Highway 6/191 include both local residents and visitors traveling through the region. Travelers would have foreground views to additional drilling from CBM development, the Helper-Price CBM Project, Matt's Summit CBM Exploration Project and potential middleground to background views to the Proposed Horse Canyon Coal Mine, the B Canyon Coal Mine and the Dugout Canyon Mine. Views along this roadway are currently predominantly natural landscapes, with industrial power plants and related facilities periodically within middleground to background views. Overall, the cumulative visual impacts from the various alternatives would be to substantially increase the industrial character of roadside views throughout the EIS Project Area. Visual changes to roadside views would potentially have a significant adverse impact on the visual image of the region as viewed by visitors.

Highway 10 is predominantly used as a local thoroughfare between Price and Castle Dale. Cumulative visual impacts could result on travelers from development in the Ferron Fairway, additional CBM drilling, the Hunter Power Plant, the Grimes Wash CBM Pilot Project, and the Buzzard Bench Project. These projects would be within foreground to middleground distance zones and would effectively alter the natural scenic qualities of the landscape to industrial views.

5.3.7 Socioeconomics

5.3.7.1 Cumulative Assessment with Proposed Action

Employment and Earnings

The discussion of cumulative employment and earnings that would be generated by the Proposed Action, plus the other ongoing, proposed, and potential CBM projects in the study area is based on a general assessment of the proportional increase in the number of CBM wells that would be developed. Since it is unclear what the timing and duration of development would be for the potential CBM projects, which are massive in scale, quantitative estimates of new jobs and earnings that would be created in the study area for given years were not calculated. The presentation of potential cumulative impacts, based on proportional increase in CBM wells, includes many assumptions that could influence its accuracy. In particular, this approach assumes construction techniques, labor demands, and costs for all of the cumulative CBM projects would be similar.

With respect to direct employment, the cumulative effect of development of the Proposed Action (601 wells), along with the ongoing projects (153 wells), proposed Helper project (64 wells), potential additional wells in the EIS Project Area (429 wells), and the potential development of the Ferron Fairway (2,800 wells), would be the creation of over a thousand new construction and CBM field jobs over the next thirty years. Given that development of the 601 new CBM wells associated with the Proposed Action alone

would employ about 214 workers at project peak, the cumulative development scenario could require about 1,450 workers to construct, operate, and reclaim the 4,000-well cumulative development, assuming employment for the other projects would be proportional to the Proposed Action.

The cumulative CBM projects would employ local workers on a seasonal (construction) and year round basis (CBM field operation and maintenance), and non-local oil and gas workers on a seasonal basis to drill and complete wells. In addition, the potential development of the five coal mining projects, construction of the new interconnect pipeline, and construction of housing (community expansion projects), would create hundreds of additional jobs for skilled workers in Carbon and Emery Counties. In general, this massive cumulative creation of new jobs for construction workers, gas field workers, and coal miners would result in a shortage of workers in those economic sectors. Virtually anyone residing in Carbon and Emery Counties possessing the proper skills, who wanted to work, could obtain employment on one of those projects. It is likely that workers that are currently underemployed (former coal miners and power plant workers), working in lower wage service and retail trade jobs, would take higher wage employment with a CBM or coal mining operations, thereby resulting in a potential shortage of service and trade sector workers as well. Given the massive scale of the cumulative CBM projects, and the potential shortage of qualified workers, it is possible that project proponents would have to recruit workers from outside of the project area to staff these projects. It is unclear what the magnitude of this immigration of workers and their families would be, however.

Similarly, cumulative direct project earnings

would increase substantially beyond those generated by the Proposed Action. Given that the Proposed Action would generate about \$3.7 million in earnings during its peak year (1996 dollars), the cumulative development of about 4,000 CBM wells, five coal mines, a pipeline project, and additional housing development, would likely generate earnings in the \$10 - 20 million range annually.

As described previously in Section 4.15, economic benefits would also occur as a result of purchases of equipment and supplies for CBM development from local area vendors (indirect economic impacts) and expenditure of CBM and other project earnings on housing, food, and goods and services provided by study area businesses (induced economic impacts). Estimates of the indirect and induced economic benefits that would be generated by the cumulative projects have not been modeled for this analysis, so specific projections of employment and earnings that would be generated have not been calculated.

In general, the direct employment of as many as 1,450 additional workers on CBM projects in the study area and expenditure of associated earnings in the local economy, as well as purchasing activity by CBM projects, would likely result in the creation of numerous jobs and earnings in Carbon and Emery Counties. These would primarily consist of service and trade sector jobs, with additional jobs created in finance, insurance, and real estate, as well as transportation and public utilities. These new jobs indirectly created and induced by the Proposed Action would comprise both expansion of existing businesses and creation of new businesses.

As the various CBM projects neared their completion, employment would decline and laid off workers would return to lower paying

service and trade sector jobs, retire, or leave the study area in pursuit of other employment opportunities. Given the massive scale of the cumulative development of CBM, coal mining, and other projects, it is possible that, should most of these projects reach completion in a similar timeframe, that large scale unemployment and an economic downturn could occur in the study area. Similarly, the reduction in direct CBM employment and earnings would indirectly result in a reduction of service and trade sector jobs and earnings.

Population, Housing, and Community Facilities and Services

As described previously, the large scale increase in skilled employment that the cumulative group of projects would generate is likely to result in the full employment of qualified local area residents, as well as the immigration of workers from outside of Carbon and Emery Counties to staff them. To the extent the projects would result in the immigration of year round workers and their families, the populations of Carbon and Emery Counties would increase. This population increase would result in an increase in demand for housing and various community facilities and services.

As described in Section 3.15, vacancy rates for housing in the study area are presently a low 4% in both Carbon and Emery Counties. To the extent the cumulative projects result in the immigration of substantial numbers of year round residents, the shortage of permanent housing would be further exacerbated and negative impacts would be experienced by residents unable to find suitable housing they could

afford. In an effort to increase the supply of housing in the local area, Carbon County has recently modified its zoning ordinance to permit the construction of more affordable modular housing units in many parts of the county. Accordingly, the Carbon County Planning Department has observed a recent increase in the construction of these housing units within the county. It is also important to note that part of the cumulative project scenario includes the development of proposed subdivisions in the project area. In total, about 88 lots would be developed, thereby increasing the supply of housing in the project area. Although these subdivisions would generally feature houses in the higher price ranges, it is likely that many units would be purchased by local residents “moving up” in the market, who would be vacating more moderately priced homes.

The use of substantial numbers of non-local seasonal construction workers for the various CBM projects would significantly increase the demand for temporary housing, such as motel rooms, mobile home sites and RV campsites.

Another important issues associated with the potential immigration of workers and their families would be the potential increase in demand on public schools in the project area. As described in Section 3.15, with the exception of East Carbon, public schools in Carbon County are nearing capacity at all grade levels. In Emery County, the elementary school grade levels have room for additional students, while the middle and high schools at or above capacity. The potential for immigration of year round workers and their families therefore has the potential to negatively impact local school districts to the extent overcrowding would

result. In response to potential school overcrowding, the school districts would have to expand facilities to accommodate the additional students. From a fiscal standpoint, the development of the potential cumulative CBM projects and coal mines would substantially increase assessed value in both counties, thereby increasing ad valorem tax revenues both counties would receive. Since the county school districts receive the largest share of ad valorem tax revenue, it is likely that the development of the cumulative projects would mitigate their own impact of increased school enrollment to a large extent. Additional information on cumulative ad valorem tax revenue is presented in the following section.

Costs and Benefits of the Proposed Project and Local Government Fiscal Conditions

In terms of actual financial costs to the local governments of the study area, the most important potential project-related impacts concern the use of county roads for access to potential CBM project locations, and increased demands on public schools due to project-related population growth and increased enrollment. Other potential costs could include expansion of infrastructure, such as water supply, wastewater treatment, and parks and recreational facilities, and expansion of law enforcement and fire protection services to serve potential population growth in the study area. From a fiscal benefits perspective, the cumulative CBM and coal mining projects would generate substantial mineral royalties and various types of tax revenue for local governments and the State of Utah.

Cost of County Road Maintenance

For the Proposed Action and other cumulative projects, access to considerable portions of the CBM development area from state and federal highways would require the use of county roads and could increase maintenance costs borne by the special districts. Discussions with the Carbon County Roads Special Service District have revealed that royalty payments from the proposed CBM projects would more than compensate for any increased maintenance costs the County may have to bear in the future. Similar beneficial fiscal impacts are anticipated for the Emery County Special Service District #1.

Cost of Increased Enrollment in Public Schools

Based on very preliminary estimates of the labor demands of the cumulative CBM and coal mining projects, it is possible that a substantial immigration of workers into Carbon and Emery Counties would occur over the next twenty to thirty years, thereby increasing the number of school age children in the study area. Since public schools in both Carbon and Emery Counties are currently at or near capacity at many grade levels, it is possible that the school districts in both counties may have to expand their facilities and hire more staff to handle this potential growth, or implement busing programs to transport students from overcrowded schools to schools operating below capacity. Since it is unclear what the timing and magnitude of potential population growth would be, the extent of the increase in demand on public schools and associated costs to the county school districts is unknown at this time.

The Permanent Community Impact Fund

As described in Section 3.15, an important source of revenue that would be contributed by the cumulative CBM and coal mining projects, that is related to mineral royalty payments, is the Permanent Community Impact Fund (PCIF), which is administered by the State of Utah. Royalty payments from the cumulative CBM and coal mining projects would contribute tens of millions of dollars to the PCIF over their lives, which would result in beneficial impacts for cities that would receive PCIF funds within the study area, as well as in other parts of Utah. Over the long-term, communities in Carbon and Emery Counties would be eligible for millions of dollars in grants and loans from the PCIF to fund a variety of infrastructure projects and other community facilities, such as roads, sewer projects, educational institutions, and recreational facilities they would need to accommodate potential future growth.

State Mineral Royalties and Taxes

Mineral lease payments are also collected by the State of Utah for wells producing on state lands. In 1995, state royalty payments associated with RGC CBM wells amounted to \$1.74 million. Over the life of the proposed project and other cumulative projects, these payments would increase each year until the projects reach full production. This revenue would be paid into both the State School Trust and the Utah General Fund; the amounts allocated would be based on the types of state lands leased. Severance and Conservation taxes on gas produced by the proposed project would also contribute revenue to the state government. It is estimated that these tax payments

associated with proposed wells would be \$300,000 for RGC alone in 1996 and would increase during the construction phase of the project due to increases in production. Over time, as production would decline, this source of revenue would also decline.

Local Ad Valorem Tax Revenue

With respect to the cities and counties of the study area, another important source of revenue that would be generated by the proposed project would be ad valorem tax that would be levied on improvements constructed by RGC and the other companies in the cumulative impact study area. These revenues would be used by the county to fund a variety of services and facilities. The Carbon and Emery County School Districts would receive the largest portion of county ad valorem tax revenue. Over time, as the number of wells and improvements were increased, ad valorem taxes would increase correspondingly. As described in Section 4.15, estimated ad valorem tax revenue that would be generated by RGC alone (601 new CBM wells) would be \$11.62 million for Carbon County, and \$1.5 million for Emery County. With the development of a cumulative total of about 4,000 wells, plus the five coal mining projects, the pipeline, and additional housing, it is likely that the cumulative project development would generate several tens of millions of dollars in additional ad valorem tax revenue for the two county study area.

These increased revenues could be used by the counties for expanding and/or improving public schools, as well as other communities facilities and services. In general, this increase in revenue would help to mitigate the increase in

demand for community facilities and services generated by increased population associated with immigration of cumulative CBM project workers.

Sales and Use Tax Revenue

Purchasing activity by RGC and the other CBM companies would generate sales and use tax revenue for the cities and counties of the study area and the State of Utah. Although precise purchasing amounts are not available for all of the potential CBM projects, it is estimated that purchasing activity in the local area would generate many tens of thousands of sales tax dollars for state and local governments. Local governments in turn would use this tax revenue for providing services and operating community facilities, thereby benefiting local area residents, or at least helping to accommodate new residents who relocate to the project area to staff the various CBM and mining projects.

In summary, the cumulative projects would increase many of the costs borne by cities and counties in the study area of maintaining and upgrading community facilities and services due to potential population growth and increased use of county roads for access to CBM developments and coal mining projects. On the other hand, since most of the projects considered for cumulative impacts would generate substantial mineral royalties (payments to county road districts, PCIF funds) and ad valorem tax revenue (school districts, water districts, county general funds), it is likely that the cumulative projects would mitigate their own fiscal impacts to a large extent. Given the considerable uncertainties associated with the timing and magnitude of the various projects, it is unclear at this time whether the cumulative projects would result in a fiscal net benefit or cost for the cities and counties of the study

area.

Estimating the Economic and Quality of Life Costs Associated With the Degradation of Outdoor Recreational Opportunities

Impacts to hunting and other outdoor recreation opportunities would be similar in nature to those described for the Proposed Action in Section 4.15, but would be considerably greater in magnitude and geographic extent, due to greater disturbance of game habitat and areas used for outdoor recreation. Under the cumulative impact scenario, not only would the EIS Project Area be completely developed with RGC and additional wells, other projects would impact areas suitable for hunting and recreation from north of Helper City all the way south to about Interstate 70 in Emery County, due to potential CBM development of the entire Ferron Fairway (Plates 26 and 27).

At this time, elk and deer population data, as well as habitat areas, have not been identified for the total cumulative impact study area. As a result, estimates of reduced elk and deer hunting have not been calculated and the associated loss of economic activity are not available. Since the total area impacted would be considerably greater, it is assumed that the cumulative impact to hunting would exceed the \$346,000 impact projected for the Proposed Action alone.

With respect to outdoor recreation, impacts associated with reduced or degraded recreational opportunities to local area residents would be considerably greater than described for the Proposed Action, due to the increased number and greater geographic distribution of CBM wells, and related visual and truck-related disturbance.

Potential Adverse Impacts of an Economic Boom-Bust Cycle

The analysis of the potential for the cumulative development of CBM and coal mining projects to cause to an economic boom-bust cycle in Carbon and Emery Counties must place the projects in the context of the overall study area economy. To accomplish this, estimated cumulative project employment figures were compared with 1996 employment figures provided by the Utah Department of Employment Security for the mining sector (which includes oil and gas employment), construction sector, and total non-farm employment for the study area to identify the extent to which employment would change as a result of those projects.

As described previously, the cumulative CBM projects alone could result in a net increase of as many as 1,450 total new jobs for the study area at their peak, with a period of layoffs and declining employment in the years following. Assuming the breakdown of job types would be similar to the Price CBM Project, about 29% (up to 427 jobs) of these positions would be local construction industry jobs, 32% (up to 461 jobs) would be local year round gas field jobs, and 39% (up to 562 jobs) would be specialized drilling and completion jobs occupied by non-local contractors.

For the local jobs, the addition and then loss of about 427 construction sector jobs would represent about a 96% net change in that employment sector for Carbon and Emery Counties combined, based on 1996 employment data (Utah Department of Employment Security 1996). Similarly, since CBM jobs are counted as

part of the mining industry, the addition and then loss of about 461 CBM jobs would represent about a 24% net change in the mining employment sector. When the five potential coal mining projects, with about 300 new mining jobs, are added to this analysis, there would be a net change of about 40% in the mining sector. For the economy as a whole, the addition and loss of 1,180 new local resident jobs would equate to a net change of 9.8% of total nonfarm employment in Carbon and Emery Counties, based on 1996 total employment figures. If indirect and induced employment that would be generated by the cumulative projects were added, this employment impact would be even larger. Clearly, the cumulative employment impacts to Carbon and Emery Counties would be significant in the context of the current economy. It is expected that cumulative earnings associated with the various project would have similar significance in the context of the current local economy as well. It is important to note that project-related gains and losses in employment are compared with 1996 employment values, which may be considerably different than actual employment values in the future. Actual percentages of jobs gained and lost in their respective industries and compared to the economy as a whole would ultimately depend on their actual size in the future.

Another important consideration with respect to a potential boom-bust cycle in the local economy is the timing of the various projects. The analysis above was based on an assumption that all of the potential cumulative projects would occur and their employment would peak at the same time. However, if timing of the projects were staggered to some extent, the impact on the overall economy

would be attenuated, that is, employees laid off at the completion of earlier projects would be hired to staff later projects. To the extent these projects were spread out over time, the less likely an economic boom-bust cycle would occur.

Quality of Life Issues

For those in the study area who strongly value outdoor recreation experiences, such as mountain biking and wildlife viewing, the cumulative project scenario would degrade the quality of life for those individuals. Similarly, individuals that would find the sight of CBM facilities and wells in open space areas unattractive may also feel the project would have adverse impacts on their quality of life. It is very important to consider that CBM development under the cumulative impact scenario would virtually surround the Cities of Price and Wellington, and nearby communities in Carbon County with CBM development (Plate 28). Furthermore, with the development of the Grimes Wash and Buzzard's Bench projects, as well as the entire Ferron Fairway, virtually all of the communities in Emery County along the Highway 10 corridor would also experience similar impacts (Plates 26 and 27). Local area residents who would not want to recreate in CBM developed areas would have to travel to alternative locations, often many miles away to find undeveloped public land for activities such as biking and wildlife observation.

RGC and the other gas companies would implement mitigation measures that would reduce visual impacts, such as painting CBM facilities colors that blend well with the surroundings. In addition, the maintenance of clean working areas would minimize unsightly debris. These measures would help to reduce

potential impacts to the attractiveness of the study area and associated quality of life, although recreational users of the CBM development areas may experience visual impacts that can not be fully mitigated (see Section 5.3.6).

Alternatively, the study area has a long history of mining and natural resources extraction and production. Many residents in the study area currently derive their livelihoods from coal mining, coalbed methane, and power plant operations. In general, the fact that employment in these industries provides higher wages and is the economic base of the region is well understood in the communities of the study area. Unlike other areas where a new mine or natural gas development would cause significant changes in the composition and character of local communities, the cumulative CBM and coal mining projects would be compatible with industries that have been established in the study area for many decades.

For individuals that would be employed directly or indirectly, the project may have beneficial impacts on quality of life, due to increased economic opportunity. In general, wages that would be paid to project workers would be higher than many of the wages paid to service and trade sector workers in the study area. In addition, to the extent the proposed project provides additional tax revenue and royalty income to various local government entities and increases the funding of important community facilities, such as libraries and parks, the project could have beneficial impacts on the quality of life in the study area.

5.3.7.2 Cumulative Assessment with Alternatives A, B2, and C2

In general, cumulative impacts under the various project alternatives would be similar in nature to those described above for the Proposed Action. Differences in alternatives relate to well spacing and exclusion from sensitive wildlife habitat areas in the Price CBM area only. Since development of the Ferron Fairway, other CBM projects, and the coal mining project would not change under these alternatives, there is little or no difference in cumulative impacts for these areas.

For Alternatives A, B2, and C2, which increase well density due to 80-acre spacing, cumulative employment and earnings would be greater than described under the Proposed Action. Accordingly, population growth would also be greater, resulting in an increase in demand on housing and community facilities and services. These alternatives would also increase both fiscal costs and benefits to cities and counties in the study area due to increased demands placed on county roads and community facilities and services, but also increased payment of royalties and taxes which would help pay for those increased costs. With respect to hunting and informal outdoor recreation, the greater density of CBM well development in the Price CBM area would make that area even less appealing for hunting and informal recreation. The potential for an economic boom-bust cycle would also be greater for these alternatives than described under the Proposed Action, due to their larger scale and associated larger gains and losses of employment and earnings. Quality of Life issues for Alternatives A, B2, and C2 would generally be the same as those described

for the Proposed Action, although the greater magnitude of the cumulative impacts would mean greater negative impacts on those opposed to CBM development, but greater positive impacts to those who value increased economic opportunity.

5.3.7.3 Cumulative Assessment with Alternatives B1, C1, D, and the No Action Alternative

For Alternatives B1, C1, D, and the No Action alternative, which reduce CBM development in the EIS Project Area relative to the Proposed Action, cumulative employment and earnings would be smaller than described under the Proposed Action. Accordingly, population growth would also be smaller, resulting in a smaller increase in demand on housing and community facilities and services. These alternatives would also decrease both fiscal costs and benefits to cities and counties in the study area due to decreased demands placed on county roads and community facilities and services, but also decreased payment of royalties and taxes. With respect to hunting and informal outdoor recreation, the exclusion of

CBM well development from sensitive wildlife habitats, or federal lands entirely, would reduce impacts to hunters and local area residents who value outdoor recreational opportunities in those locations. The potential for an economic boom-bust cycle would also be reduced for these alternatives, compared with the Proposed Action, due to their reduced scale and associated smaller gains and losses of employment and earnings. Quality of Life issues for Alternatives B1, C1, D, and the No Action alternative would generally be the same as those described for the Proposed Action, although the smaller magnitude of the cumulative projects would mean reduced impacts on those opposed to CBM development, and smaller benefits to those who value increased economic opportunity.